

REMARKS

Claims 2-34 are now pending in the application. Claim 1 has been cancelled, Claims 2-6, 8-11 and 13-17 have been amended, and Claim 34 has been added. The basis for these amendments can be found throughout the specification, claims, and drawings originally filed. The amendment to Claim 17 merely corrects a typographical error and does not narrow the claim scope. No new matter has been added. The preceding amendments and the following remarks are believed to be fully responsive to the outstanding Office Action and are believed to place the application in condition for allowance.

The Examiner is respectfully requested to reconsider and withdraw the rejections in view of the amendments and remarks contained herein.

REJECTION UNDER 35 U.S.C. § 103

Claims 1, 3, 8, 9 and 14-16 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Yoshikawa et al. (U.S. Pat. No. 4,506,518) in view of Nagatomo et al. (U.S. Pat. No. 4,494,383) and Alsenz (U.S. Pat. No. 5,035,119). Claim 1 has been cancelled in favor of new Claim 34.

Claim 13 is rejected under 35 U.S.C. § 103(a) as being unpatentable over Yoshikawa et al., in view of Nagatomo et al., and Alsenz as applied to Claim 1, and further in view of Takizawa et al. (U.S. Pat. No. 4,962,648).

Claim 10 is rejected under 35 U.S.C. § 103(a) as being unpatentable over Yoshikawa et al., in view of Nagatomo et al., and Alsenz as applied to Claim 1, and further in view of Tanaka (U.S. Pat. No. 4,634,046)).

Claims 2 and 4-7 are rejected under 35 U.S.C. § 103(a) as being unpatentable over Yoshikawa et al., in view of Nagatomo et al., and Alsenz as applied to Claim 1, and further in view of Bendtsen (U.S. Pat. No. 5,396,780).

Claims 17-19, 22-23, 25, 27-28 and 31-33 are rejected under 35 U.S.C. § 103(a) as being unpatentable over Yoshikawa et al., in view of Nagatomo et al., and Alsenz as applied to Claim 1, and further in view of Schaeffer et al. (U.S. Pat. No. 5,440,894).

Claims 20-21, 26 and 29-30 are rejected under 35 U.S.C. § 103(a) as being unpatentable over Yoshikawa et al., in view of Nagatomo et al., and Alsenz and Schaeffer et al. as applied to Claim 17, and further in view of Bendtsen as applied to Claim 2.

Claim 24 is rejected under 35 U.S.C. § 103(a) as being unpatentable over Yoshikawa et al., in view of Nagatomo et al., Alsenz and Schaeffer et al. as applied to Claim 17, and further in view of Tanaka as applied to Claim 10.

These rejections are respectfully traversed.

Independent Claim 34 calls for a control system for a cooling system having a compressor and a valve. See Specification at pg. 7, Paragraph [0020], pg. 14, Paragraph [0062], and FIG. 5. The control system includes a first sensor for sensing a property indicative of demand for cooling and a controller coupled to the sensor and operable to produce a variable duty cycle control signal in response to the property. See Specification at pg. 11, Paragraph [0050]. The controller modulates a capacity of the compressor in response to the variable duty cycle control signal to vary a cooling capacity of the cooling system and modulates a position of the valve in response to the

variable duty cycle control signal to further vary a cooling capacity of the cooling system. See Specification at pg. 14, Paragraph [0061] and at pg. 15, Paragraph [0063]

Independent Claim 17 calls for a cooling system including a refrigeration case, an evaporator disposed in the case, a condenser in fluid communication with the evaporator, a valve in fluid communication with the evaporator and the condenser, and a pulse-width-modulated variable capacity compressor in fluid communication with the condenser, the evaporator, and the regulator. See Specification at pg. pg. 10, Paragraph [0047], pg. 11, Paragraph [0051], and FIG. 5. In addition, independent Claim 17 calls for a first sensor for sensing a property indicative of a demand for cooling and a controller responsive to the first sensor. See Specification at pg. 11, Paragraph [0050]. The controller is responsive to the first sensor and provides a variable duty cycle control signal to the compressor to modulate a compressor capacity and to modulate the valve to a valve position, wherein an operating capacity of the cooling system is adjusted to its thermal load. See Specification at pg. 15, Paragraph [0063].

In this manner, the present invention discloses a controller (52) for a refrigeration system capable of providing a variable duty cycle control signal based on input from a suitable load sensor, such as a temperature sensor (58). See Specification at pg. 11, Paragraph [0063]. The variable duty cycle control signal is used to control a capacity of a pulse-width-modulated variable compressor (30) through actuation of a solenoid valve (56). See Specification at pg. 11, Paragraph [0050]. Actuation of the solenoid valve causes a fixed scroll member (67) to move axially away from an orbiting scroll member (64) to create a leakage path therebetween. See Specification at pg. 12, Paragraph [0055]. The leakage path selectively unloads the compressor and therefore adjusts an

operating capacity of the cooling system. See Specification at pg. 12, Paragraph [0012].

In addition to the foregoing, the variable duty cycle control signal from the controller may also be used to control various other types of refrigerant flow and pressure control devices such as refrigerant regulating valves (45c). See Specification at pg. 15, Paragraph [0063].

Therefore, the present invention discloses a controller that adjusts an operating capacity of a cooling system by providing a variable duty cycle control signal to a compressor based on a sensed system load **and** by providing a variable duty cycle control signal to a valve to modulate the valve to a valve position based on a sensed system load. See Specification at pg. 15, Paragraph [0063]. The cited art of record fails to teach or suggest such a relationship.

The Examiner states that Yoshikawa discloses a refrigeration system having a controller (49, 50) that is response to a load sensor for modulating both compressor capacity and an expansion valve opening in order to provide a proper level of refrigeration. See Office Action mailed January 11, 2005 at pg. 2. The Examiner further states that Nagatomo teaches the use of a pulse width modulated variable capacity compressor and that Alsenz teaches use of pulsing a solenoid to operate an expansion valve. See Office Action mailed January 11, 2005 at pg. 2.

Yoshikawa teaches a control condition selector (49) that includes a judging table for selectively changing operational conditions of a variable speed compressor (2), a blower (6), and an expansion valve (4). See Yoshikawa at Col. 9, ln. 68, Col. 10, Ins. 1-8, and Table 1. Yoshikawa fails to teach or suggest use of a pulse width modulated

variable capacity compressor or a pulse width modulated valve. Furthermore, Yoshikawa fails to teach a controller providing a variable duty cycle control signal. Rather, Yoshikawa teaches a variable speed compressor and an expansion valve controlled by a stepper motor (28). See Yoshikawa at Col. 3, Ins. 7-33 and at Col. 4, Ins. 30-34. Applicants respectfully submit that use of a pulse width modulated variable compressor and a pulse width modulated valve would not have been obvious to one of ordinary skill in the art at the time the invention was made.

Nagatomo teaches a compressor (1) having two cylinders, each having a different displacement. See Nagatomo at Col. 2, Ins. 58-64. Refrigerant flow into the respective cylinders is controlled by a slide valve (8, 43) and a switch valve (9). See Nagatomo at Col. 3, In. 7 and FIG. 2. The switch valve is controlled by a comparator (17) via an ON/OFF signal. See Nagatomo at Col. 3, Ins. 27-43. In this manner, the switch valve is controlled by the comparator to position the slide valve in a desired position. Therefore, Nagatomo fails to teach pulse width modulation of **both** a compressor **and** a valve to control operating capacity of a cooling system. Rather, Nagatomo teaches pulse width modulation of a valve to effectuate compressor capacity control. Therefore, Applicants respectfully submit that Nagatomo fails to teach or suggest using a variable duty cycle control signal to control compressor capacity **and** using a variable duty cycle control signal to control a valve. Therefore, Applicants respectfully submit that the prior art of record fails to teach or suggest using a variable duty cycle control signal to control a pulse width modulated variable compressor and a valve.

Applicants note that Alsenz teaches an electrically-actuated solenoid valve (i.e., expansion valve (38)). See Alsenz at Col. 5, Ins. 57-60. However, Applicants respectfully submit that Alsenz fails to teach or suggest using a variable duty cycle control signal to control the solenoid valve in conjunction with using a variable duty cycle control signal to control a pulse width modulated variable compressor.

Because Yoshikawa, Nagatomo, and Alsenz do not disclose use of a variable duty cycle control signal to control a pulse width modulated variable compressor and using a variable duty cycle control signal to control a valve in order to adjust an operating capacity of the cooling system, and none of the cited references cures this deficiency on Yoshikawa, Nagatomo, and Alsenz, Applicants' invention is not taught or suggested by the prior art and reconsideration and withdrawal of the rejection is respectfully requested.

In this manner, it is believed that independent Claims 1 and 17, as well as Claims 2-16 and 18-33, respectively dependent therefrom, are in a condition for allowance in light of the art of record. Accordingly, Applicants respectfully request reconsideration and withdrawal of the rejection.

ALLOWABLE SUBJECT MATTER

The Examiner states that Claims 11-12 would be allowable if rewritten in independent form. Applicants have not amended Claims 11-12, as independent Claim 34 is believed to be in condition for allowance in light of the foregoing remarks.

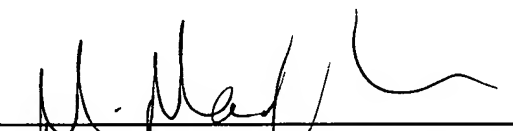
CONCLUSION

It is believed that all of the stated grounds of rejection have been properly traversed, accommodated, or rendered moot. Applicants therefore respectfully request that the Examiner reconsider and withdraw all presently outstanding rejections. It is believed that a full and complete response has been made to the outstanding Office Action, and as such, the present application is in condition for allowance. Thus, prompt and favorable consideration of this amendment is respectfully requested. If the Examiner believes that personal communication will expedite prosecution of this application, the Examiner is invited to telephone the undersigned at (248) 641-1600.

Respectfully submitted,

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